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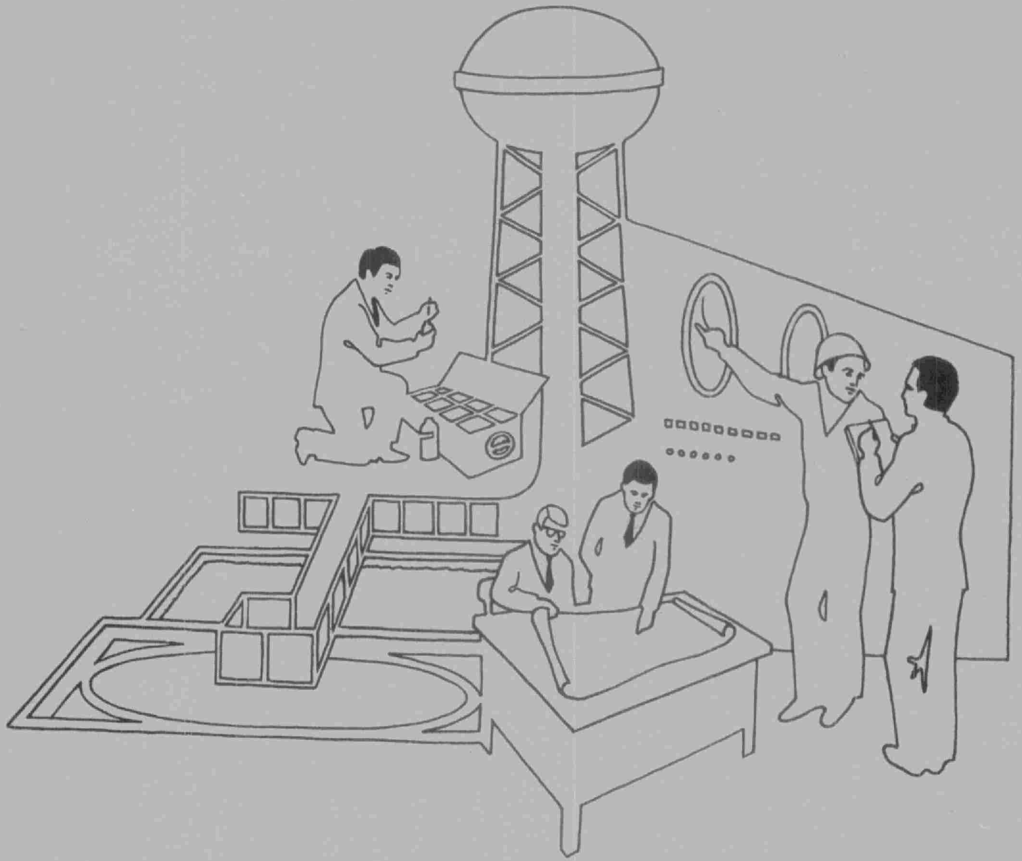

WATER POLLUTION SURVEY

of the

HAYHOE MILLS DRAINAGE AREA

TOWN OF VAUGHAN

1971

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ONTARIO WATER RESOURCES COMMISSION

WATER POLLUTION SURVEY
OF THE
HAYHOE MILLS DRAINAGE AREA

COMMUNITY OF PINE GROVE
TOWN OF VAUGHAN
REGIONAL MUNICIPALITY OF YORK

DISTRICT ENGINEERS BRANCH
DIVISION OF SANITARY ENGINEERING
1971

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I INTRODUCTION

During the months of June, July & August, 1971, an investigation was carried out on the Hayhoe Mills drainage area and the community of Pine Grove. The main concern of this report is the tailrace from the mill itself which has been a source of public complaint for the past decade. In addition to the pollution survey a door-to-door survey in conjunction with the York Regional Area Health Unit was conducted to evaluate well water quality, septic tank problems, and to find any illegal plumbing connections.

II RECOMMENDATIONS

As a result of the investigations carried out in the community of Pine Grove and on the Hayhoe Mills Drainage area the following recommendations are presented.

1. Sanitary sewers should be constructed for the community in order to solve the problems of the inadequate septic tank systems particularly those of the Pine Grove Nursing Home, Hayhoe Mills, Pine Grove Market and the Hayhoe Residence.
2. The Hayhoe Mills Tailrace should be tiled for its full length and filled so as to discourage the dumping of refuse in it. Unless seepage through the wheat tailings is excluded from the tile it may be necessary to remove the tailings which have already been deposited as fill in part of the tailrace.

3. A municipal water system should be provided for those homes in Pine Grove on shallow wells to ensure that a potable water of safe sanitary quality and adequate quantity is available at all times. This water system should not be put in unless sewers are provided to handle the greater waste flow which will result.

III GENERAL

The Pine Grove area was originally established as a summer cottage retreat by the residents of Toronto. These cottages are now used as permanent residences with new houses having been built to fill up the area. Homes not on municipal water have, with only a few exceptions, shallow dug wells, 6 to 8 feet deep. The exceptions are the occasional drilled wells. Sewage disposal is by septic tanks and tile fields.

There have been recurring problems with disposal systems throughout the years. The most prominent source of complaint has been the Hayhoe Mills Tailrace.

When Hurricane Hazel altered the course of the Humber River, Hayhole Mills was left with an empty headrace and tailrace. The milling operation was changed to electric power and the headrace was blocked off. The tailrace was supposedly left in use to provide drainage for storm runoff and seepage which collects under the mill.

Many of the residences adjoining the tailrace had basement drains and sanitary wastes discharging to it. These connections were traced and the tile beds put back into use, yet during this most recent investigation three tile beds were found requiring maintenance. The York Regional Area Health Unit was informed of these problems immediately.

The tailrace has been and still is used by some of the residents to discard household refuse. The debris frequently blocks the flow in the tailrace and the resulting stagnation and the decomposition of the bottom material adds to the strong odours.

IV HAYHOE MILLS DRAINAGE COURSE

There are three sources of water contributing to the flow in the tailrace. The most significant is the leachate coming out of the bank of the roadside ditch on the east side of the tile bed serving the Pine Grove Nursing Home. The nursing home is located across Pine Grove Road from (west of) Hayhoe Mills. On each of three sample runs, fecal coliform bacteria were found in samples taken from this ditch.

An additional problem here was pointed out by Mr. J. Burnham of the York Regional Area Health Unit. To establish a point of fact, the flow to the nursing home's tile bed was temporarily stopped by pumping out the septic tank, yet the leachate still collected in the ditch. It was then concluded that ground water was permeating through some part of the tile field as the bacteriological samples would indicate. This theory of moving ground water is substantiated by reports of the need for constant dewatering in various excavations in the immediate area in the past.

Flow also gains access to this roadside

ditch via an 8-inch clay tile which drains an area north of the nursing home property. Sample results indicated fecal coliform bacteria present in this flow as well.

The ditch then follows the curvature and slope of Pine Grove Road and during runoff conditions the water enters the now unused surge chamber of the old headrace. From the surge chamber the water flows under the road and into the mill. Water that does not make its way into the surge chamber continues along the ditch for approximately 20 yards to where it disappears into the ground.

A third source of flow to the tailrace comes through the east side wall of the mill foundation. Samples of this ground water were collected where it comes through the crack in the wall and the examination results showed fecal coliform bacteria present. The water is directed across the basement floor, under the wheat silos, and out into a vertical pipe on the south side of the mill where it joins the flow from the surge chamber.

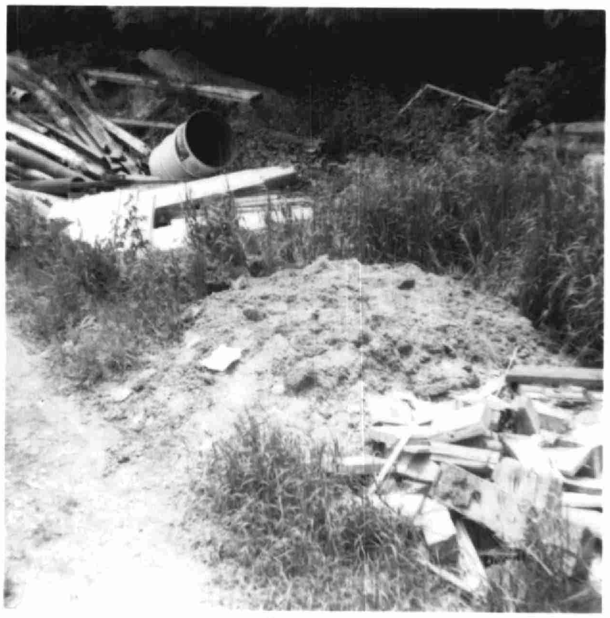
V HAYHOE MILLS TAILRACE

The tailrace is approximately 800 feet long with the first 300 feet piped by 10-inch concrete tiles and filled in. The tiles were supposedly sealed with mortar to prevent any water seeping into the ground. A considerable amount of this fill consisted of wheat tailings discarded from the mill.

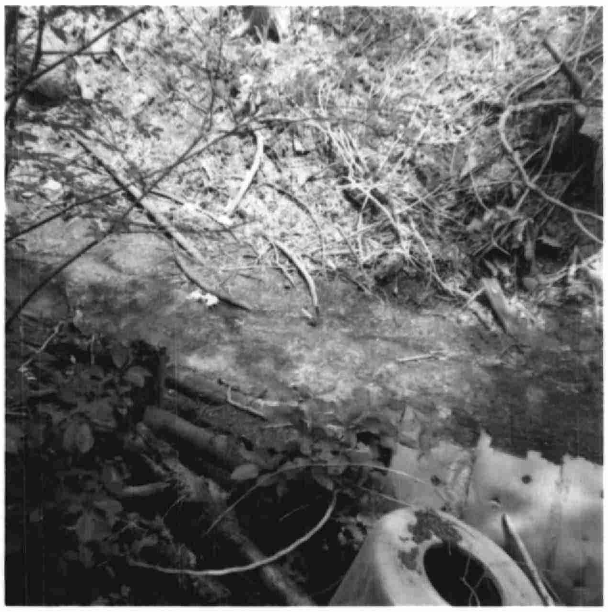
During the investigation water samples were collected at each end of the pipe and compared. Those taken from the vertical pipe were relatively clear and colourless and had a slightly musty odour. At the downstream end of the tiles the water was quite brown and turbid with a strong odour. There was also an extreme increase in BOD at the tile outlet. Bacteriological samples from both ends indicate high counts of total coliform and fecal bacteria.

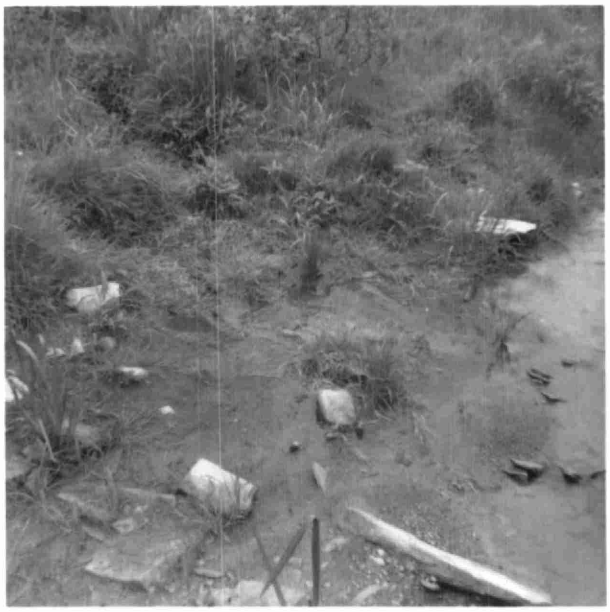
Biological analysis of the bottom material at each end yielded the following results.

"Sample #1 collected from the bottom of the vertical pipe at the beginning of the tailrace tiles contained sand (70%) and organic material, including numerous grain kernels and husks in a slightly decomposed state. Numerous midge fly larvae (blood worms) were also present. Sample #2 collected from the bottom of the tailrace at the outlet end of the tiles contained a much more odourous black material which was comprised of sand (90%) and a black organic matter which was decomposed beyond recognition. Associated with this material were oligochaete worms (sludge worms) which are pollution indicator organisms which require a source of decomposed organic wastes as a food supply." The bacteriological and biological examinations indicate that the wheat tailings are



Wheat tailings and debris over portion of covered section of tailrace





Open section of tailrace

Tailrace at Humber River

providing a media for bacteria and other organisms to grow in.

This investigation also found that three tile beds are located partially over the fill area. These belong to the mill itself, the Hayhoe Residence, and the Pine Grove Market with its residence and apartment.

A number of bore holes were made along the route of the tailrace tile to determine the extent and condition of the wheat tailing area as well as the influence of the tile field. A six-foot long hand auger was used. Where the tailings were found they were only three feet from the surface and extended down as far as the auger could reach.

In the area where one of the tile beds was believed to be located the hole passed through a layer of black soil and organic material characteristic of soil conditions found in a tile bed. Just below this layer, the tailings started. The material was in various stages of decomposition and very wet. The strong odour of the wet tailings was the same as that experienced in the open portion of the tailrace.

The bore holes show that the tile beds do affect the wheat tailings. It is also concluded that the tailrace tiles are no longer sealed and are allowing the leachate from above to enter the tailrace flow.

VI REGIONAL MUNICIPALITY OF YORK STORM SEWER

A storm sewer installed by the old County of

York Roads Department discharges into the Humber River after conveying storm water from Islington Avenue North down across the filled portion of the tailrace. On each sampling of the flow fecal coliform bacteria counts were encountered indicating the presence of sanitary wastes in the storm flow. Fecal coliform bacteria were also present in samples taken in an open ditch on Gamble Street before it enters the storm drain. These results would indicate problems with septic tank systems on Gamble Street and quite possibly along Islington Avenue North as well.

VII DOOR-TO-DOOR SURVEY

Part of this investigation involved a door-to-door survey of the homes in the community of Pine Grove. This work was a combined effort by Commission district staff and personnel from the York Regional Area Health Unit. The purpose of this survey was to evaluate the quality of the wells and to try and locate any illegal plumbing connections to storm drains or ditches.

One hundred and forty-eight premises were visited of which only 89 had occupants at home. Thirty-nine of the homes inspected were on their own well supply and samples were taken. Thirty-one per cent or 12 of the wells sampled were unsatisfactory, 2 of which having fecal coliform bacteria present indicating sanitary wastes as a possible cause of contamination.

Previous applications have been presented asking that a municipal water supply be constructed. Information available at the time indicated that the private wells were functioning satisfactorily. It was pointed out that an increased supply of water would have detrimental effects to the septic tank and tile bed systems.

A potable water supply of safe sanitary quality may be provided in two ways; drilled wells or a municipal system. In either case if sanitary sewers are not provided one can expect increased problems with septic tank and tile field installations because of the availability of adequate water. A municipal system would appear to be the preferable solution.

During the door-to-door survey on Pine Ridge Road, roadside ditch samples were collected and the examinations showed evidence of incompletely treated leachate from septic tank tile beds.

VIII TOWN OF VAUGHAN - PINE GROVE ROAD STORM SEWER

The Town of Vaughan is proceeding with road work on Pine Grove Road which includes a storm sewer. The gutters will collect the surface water beside the nursing home and the crushed stone around the sewer pipe will collect the ground water and all of it will be directed straight to the Humber River. This project will eliminate part of the flow to the Hayhoe Mills tailrace but will still allow contaminated water to enter the Humber River.

IX SUMMARY

The pollution survey of the Hayhoe Mills Drainage Area and the community of Pine Grove was conducted in order to find a solution to the long standing problem of the Hayhoe Mills Tailrace and to investigate the need for municipal service. The investigation found the Pine Grove Nursing Home and contaminated ground water to be the major sources of flow to the tailrace. The three tile beds located over the (covered section of the) tailrace also contribute to the flow after percolating through the decaying wheat. The decomposition of the wheat tailings used as fill of the tailrace, along with the organic matter on the bottom of the open section, are the cause of the strong odour which has been the source of complaints in the past.

The Regional Municipality of York storm sewer which traverses the mill property and crosses the tailrace was found to be conveying contaminated water. The cause is faulty septic tank systems on Gamble Street and quite probably Islington Avenue North as well.

Fecal coliform bacteria were also found in the roadside ditch on Pine Ridge Road.

A door-to-door survey conducted in conjunction with the York Regional Area Health Unit found 31 per cent of the wells sampled to be of doubtful quality. The owners of the wells of doubtful quality were notified by letter as soon as the sample results were available. Many of the wells are not able to supply water in dry weather.

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TABLE 1

SAMPLE RESULTS

HAYHOE MILLS DRAINAGE AREA

SAMPLING POINT NUMBER	DESCRIPTION	DATE	5-DAY BOD	SOLIDS		COLIFORMS PER 100 ML	
				Total (ppm)	Susp. (ppm)	Total	Fecal
P-1	Ditch beside Pine Grove Nursing Home	Nov. 11/70	-	-	-	1,700,000	-
		June 9/71	19	1580	380	880,000	1,200
		June 30/71	10	1460	390	660,000	L10,000
		July 28/71		-	-	45,000	600
P-2	8" clay tile to ditch	July 28/71	1.2	-	<5	8,600	1,240
P-3	Standpipe on north side of mill	June 9/71	16	2740	600	24,000	6,000
		June 30/71	3	1960	10	31,000	3,000
P-4	Ground water from mill foundation	July 28/71	1.8	-	15	52,000	2,400
P-5	Standpipe on south side of mill	June 30/71	14	2300	80	900,000	31,000
		July 28/71	1.4	-	60	637,000	800
P-6	Tile discharge of tailrace	May 19/71	110	1350	60	76,000	7,000
		June 9/71	500	2000	20	60,000	30,000
		June 30/71	240	1760	75	3,000,000	21,000
		July 28/71	800	-	70	150,000	4,000

TABLE 1 - (Cont'd)

SAMPLING POINT NUMBER	DESCRIPTION	DATE	5-DAY BOD	SOLIDS		COLIFORMS PER 100 ML	
				Total (ppm)	Susp. (ppm)	Total	Fecal
P-7	Tailrace discharge to Humber	June 9/71	30	1680	10	21,000	1,000
		June 30/71	11	1540	5	40,000	2,200
P-8	Humber River at Pine Grove Road	June 9/71	0.8	370	5	150	10
		June 30/71	1.0	340	5	1,200	L1,000
P-9	Humber River downstream from tailrace discharge	June 9/71	1.0	380	5	600	L10
		June 30/71	0.8	340	5	1,000	L100
P-10	Regional Municipality of York Roads Storm Sewer Outfall to Humber	June 9/71	1.0	1100	5	160,000	3,300
		June 30/71	1.2	730	5	180,000	900
		July 28/71	-	-	-	600,000	4,200
P-11	Ditch on Gamble Street draining to Storm Sewer on Islington	June 14/71	-	-	-	59,000	190
		June 30/71	16	1430	230	12,000,000	L1,000
P-12	Pine Ridge Road East Side Ditch	June 14/71	10	1750	50	19,000	40
P-13	Pine Ridge Road West Side Ditch	June 14/71	65	5870	270	76,000	1,000

APPENDICES

GLOSSARY OF TERMS

Bacteriological Examinations - The Most Probable Number Technique is used by the Ontario Department of Health to obtain an approximation of the actual number of coliform organisms present. The Membrane Filter Technique is used by the OWRC to obtain a direct count of coliform organisms. These organisms are the normal inhabitants of the intestines of man and other warm-blooded animals. They are always present in large numbers in untreated sewage and are, in general, relatively few in number in other stream pollutants.

Biochemical Oxygen Demand (BOD) - The biochemical oxygen demand test indicates the amount of oxygen required for stabilization of the decomposable organic matter found in sewage, sewage effluent, polluted waters, or industrial wastes by aerobic biochemical action.

Solids - The analyses for solids include tests for total, suspended and dissolved solids. The total solids is a measure of the solids in solution and in suspension. Suspended solids indicate the measure of undissolved solids of organic or inorganic nature whereas the dissolved solids are a measure of those solids in solution.

SIGNIFICANCE OF LABORATORY ANALYSES

Bacteriological Examination - The presence of coliforms indicates pollution from human or animal excrement or from some non-faecal forms.

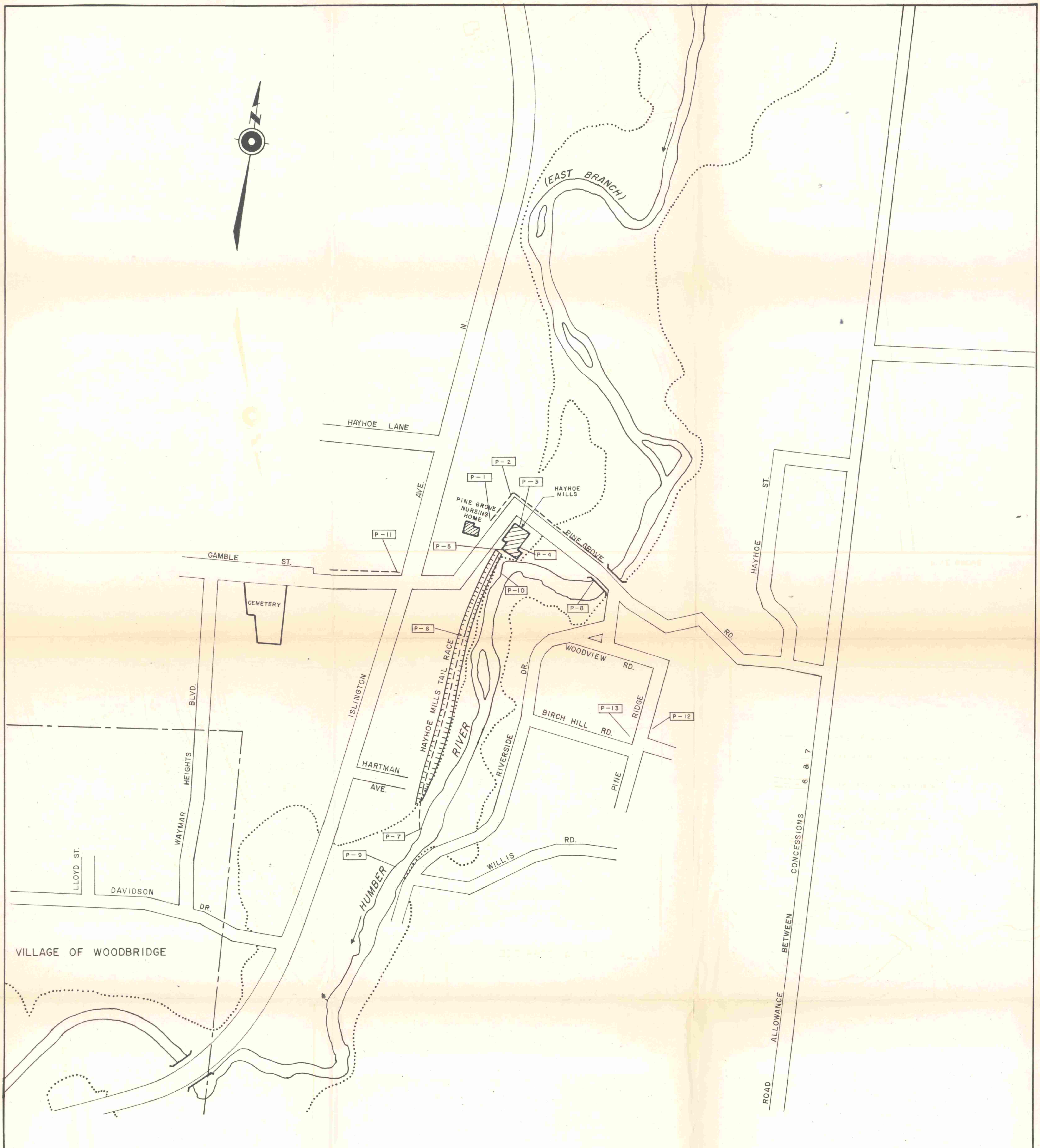
The OWRC Laboratories employ the Membrane Filter (MF) Technique of examination to obtain a direct enumeration of coliform organisms. The Department of Health Laboratories use the Most Probable Number (MPN) enumeration and coliform counts are reported as Total Coliform Organisms (TC) and Fecal Organisms (FC).

Sanitary Chemical Analyses

Biochemical Oxygen Demand (BOD) - Biochemical Oxygen Demand is reported in parts per million (ppm) and is an indication of the amount of oxygen required for the stabilization of decomposable organic or chemical matter in water. The completion of the laboratory test requires five days, under the controlled incubation temperature of 20^{o} centrigrade.

The OWRC objective for surface water quality is an upper limit of four (4) ppm.

Solids - The value for solids, expressed in parts per million, is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses with regard to surface water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, decomposition in streams and injury to the habitat of fish.



LEGEND

P-9 — SAMPLING POINT
…… — HUMBER FLOOD PLAIN
▤ — OPEN SECTION OF TAILRACE
▥ — COVERED SECTION OF TAILRACE
– – – — DRAINAGE DITCH

ONTARIO WATER RESOURCES COMMISSION

COMMUNITY OF PINE GROVE
TOWN OF VAUGHAN
HAYHOE MILLS DRAINAGE AREA
1971

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